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PORTLAND HARBOR RI/FS
**ROUND 2 GROUNDWATER PATHWAY
ASSESSMENT SAMPLING AND ANALYSIS PLAN**

**ATTACHMENT 3
FIELD SAMPLING PLAN
SAMPLING OF SHORELINE SEEPS
DISCHARGING TO HUMAN USE
BEACHES**

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This document is currently under review by US EPA and its federal, state and tribal partners, and is subject to change in whole or part.

April 29, 2005

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The Lower Willamette Group

Prepared by:
Kennedy/Jenks Consultants
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Attachment A. Standard Operating Procedure for Shoreline Seep Sampling

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Figure 2-1. Location of Outfall 22B

Figure 2-2. Discharge from Outfall 22B in Transient Use Beach

LIST OF ACRONYMS

BLRA	baseline risk assessment
COI	chemical of interest
COPC	chemical of potential concern
EPA	U.S. Environmental Protection Agency
FSP	field sampling plan
HHRA	human health risk assessment
HSP	health and safety plan
LWG	Lower Willamette Group
MDL	method detection limit
MRL	method reporting limit
PAHs	polycyclic aromatic hydrocarbons
PCBs	polychlorinated biphenyls
PRG	preliminary remediation goal
QAPP	quality assurance project plan
RI/FS	remedial investigation/feasibility study
RM	river mile

1.0 INTRODUCTION

This Round 2 field sampling plan (FSP), which is Attachment 3 to the Round 2 Groundwater Pathway Assessment Sampling and Analysis Plan (SAP) (Integral et al. 2005), presents the approach and procedures for collection of samples of the surface expression of groundwater (seeps) discharging to human use beaches that are accessible for direct contact. Section 4 of the SAP presents the data quality objectives (DQOs) for sampling of seeps discharging to human use beaches to support the human health risk assessment (HHRA) for the remedial investigation/feasibility study (RI/FS) of the Portland Harbor Superfund Site (Site). Project and site-specific background information are presented in detail in the SAP.

An addendum to the Round 2 Quality Assurance Project Plan (Round 2 QAPP) (Integral and Windward 2004) will be prepared and submitted at a later date, after specific sampling locations and target analytes are identified. The QAPP addendum will contain information on analyses that are pertinent for completion of the work identified in this FSP.

In preparation for the Round 1 sampling program, a health and safety plan (HSP; Striplin Environmental Associates 2002) was submitted to EPA on June 14, 2002. This HSP will be amended, as necessary, for Round 2 activities to ensure the health and safety of field and laboratory personnel.

1.1 OBJECTIVES OF ROUND 2 SHORELINE SEEP SAMPLING AT HUMAN USE BEACHES

The objective of the Round 2 shoreline seep sampling at human use beaches is to collect samples that may contain upland chemicals of interest (COIs) from surface expressions of groundwater discharges above the river stage in areas of human use at the Site. As noted in the Exposure Point Concentration Calculation Approach and Summary of Exposure Factors Interim Deliverable for the HHRA (Kennedy/Jenks 2004), only beaches used by recreational beach users and transients will be included in this analysis, as dockside workers are not expected to come into contact with shoreline seeps discharging to industrial beach areas. Therefore, samples may be collected from seeps or other surface expressions of groundwater at beaches designated as recreational or transient use beaches.

1.2 DOCUMENT ORGANIZATION

The remaining sections of this document describe the data adequacy review process, the proposed sampling plan, and field procedures that will be used to collect Round 2 samples of shoreline seeps discharging to human use beach areas that may contain upland COIs. Section 2 describes the process for identifying sampling areas and the

procedures for the data adequacy review and sampling area reconnaissance that will be conducted prior to collecting samples. Section 3 describes procedures that will be used in the field, including specific sampling methods and the proposed schedule. Section 4 summarizes the process for selecting analytical suites to be tested on samples from each location. Section 5 summarizes how the data will be reported. Finally, references are provided in Section 6.

2.0 SAMPLING AREA SELECTION, RECONNAISSANCE AND DATA ADEQUACY REVIEW

This section describes the process used for selecting sampling areas and the methods that will be used for data adequacy review of any groundwater seep or discharge data collected at the selected areas.

2.1 SAMPLING AREA SELECTION CRITERIA

For a seep or discharge to be selected for sampling, the following criteria must be met:

1. The seep or discharge occurs within a designated transient or recreational human use beach area
2. The seep or discharge occurs above the water line during periods of low water levels in the river
3. The seep or discharge is likely to contain upland COIs.

Selection of sampling areas meeting these criteria was based on information presented in the Programmatic Work Plan (Integral et al. 2004), the Results of Seep Reconnaissance Survey River Mile 2 – 10.5 (GSI 2003a), the Upland Groundwater Data Review Report (GSI 2003b), and more recent observations in identified human use beach areas. Fifty potential seep locations were identified during the seep reconnaissance, with 12 of the potential seeps observed at or near a designated human use beach area. Of these, only three sites were identified where it was likely for upland COIs to reach seeps or other surface expressions of groundwater discharging to human use beaches (GSI 2003b): City of Portland storm sewer outfall 22B, Willbridge, and McCormick and Baxter (at Willamette Cove). No observations since the seep reconnaissance have identified additional seeps or other surface expressions of groundwater within a human use beach.

Of the three human use beaches in which surface expressions of discharging groundwater occur that are likely to contain upland COIs, one beach is restricted to industrial use (Willbridge) and does not meet the first criterion above. The seep identified in Willamette Cove downgradient of McCormick and Baxter during the seep survey (GSI 2003a) was capped during remedial activities in 2004.

The only location that meets all three criteria is the beach where Outfall 22B discharges. This area is designated as a transient use beach. The storm water pipeline that discharges at Outfall 22B provides a conduit for surface discharge of groundwater containing COIs that infiltrates into the pipe upland of the beach. The discharge location is shown on Figure 2-1.

Samples of the discharge at Outfall 22B have periodically been collected for analysis. During a recent period without rain (September 2004), samples of water in the pipe

were collected at manhole locations in the storm sewer. A sample of the pipe discharge was also collected at that time. All samples were analyzed for potential contributor COIs. Results of these analyses were recently submitted to the Oregon Department of Environmental Quality (DEQ) (AMEC 2005). Prior to collection of additional samples at this location, these data will be reviewed to determine if they are adequate for the HHRA data needs.

2.2 DATA ADEQUACY REVIEW

The discharge at Outfall 22B has been sampled several times by Rhone-Poulenc. Available data (AMEC 2005) will be reviewed to determine if they are adequate to evaluate risk to human health from direct contact. The review will consider sampling locations and methods, chemicals tested, and comparison of method detection limits (MDLs) and method reporting limits (MRLs) to the risk-based screening levels for groundwater seeps. EPA Region 9 Tap Water Preliminary Remediation Goals (PRGs) (EPA 2004) will be used as screening levels, as described in the Process to Identify Chemicals of Potential Concern (COPCs) technical memorandum (Kennedy/Jenks and Windward 2004). If the data are adequate to assess risk from direct contact with the discharged water, no further sampling will be conducted. The results of the data adequacy review will be summarized in an interim deliverable to EPA and its partners. Risk assessment results for this exposure pathway will be presented in the Comprehensive Round 2 Site Characterization Summary and Data Gaps Analysis Report (Round 2 Comprehensive Report) and the Baseline Risk Assessment (BLRA).

2.3 SITE RECONNAISSANCE

If the data adequacy review indicates that additional sampling is needed at Outfall 22B, a pre-sampling reconnaissance will be conducted by the LWG with EPA and its partners at this location. The purpose of the reconnaissance at the beach where Outfall 22B discharges will be to observe the discharge and its flow across the beach and to determine appropriate sampling methods.

3.0 SAMPLING METHODS AND SCHEDULE

If it is determined on the basis of the data adequacy review that additional sampling is needed at Outfall 22B, sampling methods will be identified in consultation with EPA and its partners prior to sampling. The following sampling methods are proposed as general methods at this time and may be refined prior to any sample collection. If additional sampling is needed, one sample of the water that flows across the beach will be collected immediately after it discharges from the pipe.

3.1 PROPOSED SAMPLING METHODS

The discharge from Outfall 22B flows across the transient use beach area near river mile (RM) 7. Over time, the flow has carved out a shallow channel along the beach that may be deep enough to collect a grab sample immediately downstream from the point of discharge according to the Standard Operating Procedure (SOP) in Attachment A. A sample collected at this location would be representative of the water encountered by transients accessing this beach. The sample will be collected in such a manner as to minimize the introduction of any potential effects of underlying beach sediment on water quality. This location will not be sampled within 72 hours after a rainfall event. In addition, the field sampling crew will walk the length of the sewer line prior to collecting samples in an attempt to observe whether any visible non-groundwater sources of water are entering the system on the day of sample collection. The City of Portland will be contacted to find out if they know of any activities in the 22B pipeshed that could be contributing flow at the sampling time. If other sources of water to the pipe are observed or otherwise known to be present, sampling will be postponed.

3.2 SAMPLE IDENTIFICATION

Following the field reconnaissance and finalization of the sampling method and analytical suites, the sample station will be numbered in accordance with the project sample identification code convention described in the Round 2 FSP (Integral et al. 2004).

3.3 SAMPLE ANALYSES

The potential target analytes for the Outfall 22B discharge are based on information in the sampling report for Outfall 22B recently submitted by AMEC (2005). The list includes groundwater-related COIs detected at upland facilities that may affect the chemicals present at Outfall 22B:

- Metals
- Polycyclic aromatic hydrocarbons (PAHs)
- Organochlorine pesticides
- Herbicides
- Polychlorinated biphenyls (PCBs)
- Semivolatile organic chemicals
- Volatile organic chemicals
- Dioxins and furans.

Field measurements of temperature, conductivity, and pH will also be collected at the time of sampling, as described in the attached SOP.

After the data adequacy review, if sampling is to be conducted, the list of target analytes for lab analysis and analytical methods will be finalized. An addendum to the Round 2 QAPP (Integral and Windward 2004) will be submitted based on the analytical needs. The QAPP addendum will provide additional detail regarding analytical methods, sample containers, volumes, preservation, and hold times, as well as MDLs and MRLs for the final list of target analytes. Analytical concentration goals will be based on Region 9 Tap Water PRGs (EPA 2004).

3.4 SAMPLING SCHEDULE

If sample collection is necessary, dates for site reconnaissance and sample collection will be determined in conjunction with EPA and its partners following EPA approval of this FSP and completion of the data adequacy review. It is anticipated that sampling will occur in late summer or early fall 2005 during low river stage conditions and can be completed within one field day. Site reconnaissance and sample collection may be combined and completed in one field trip.

4.0 REPORTING

Upon completion, results of the data adequacy review will be submitted in an HHRA interim deliverable. This interim deliverable will provide a determination regarding the need for additional data collection, if any, from the Outfall 22B area.

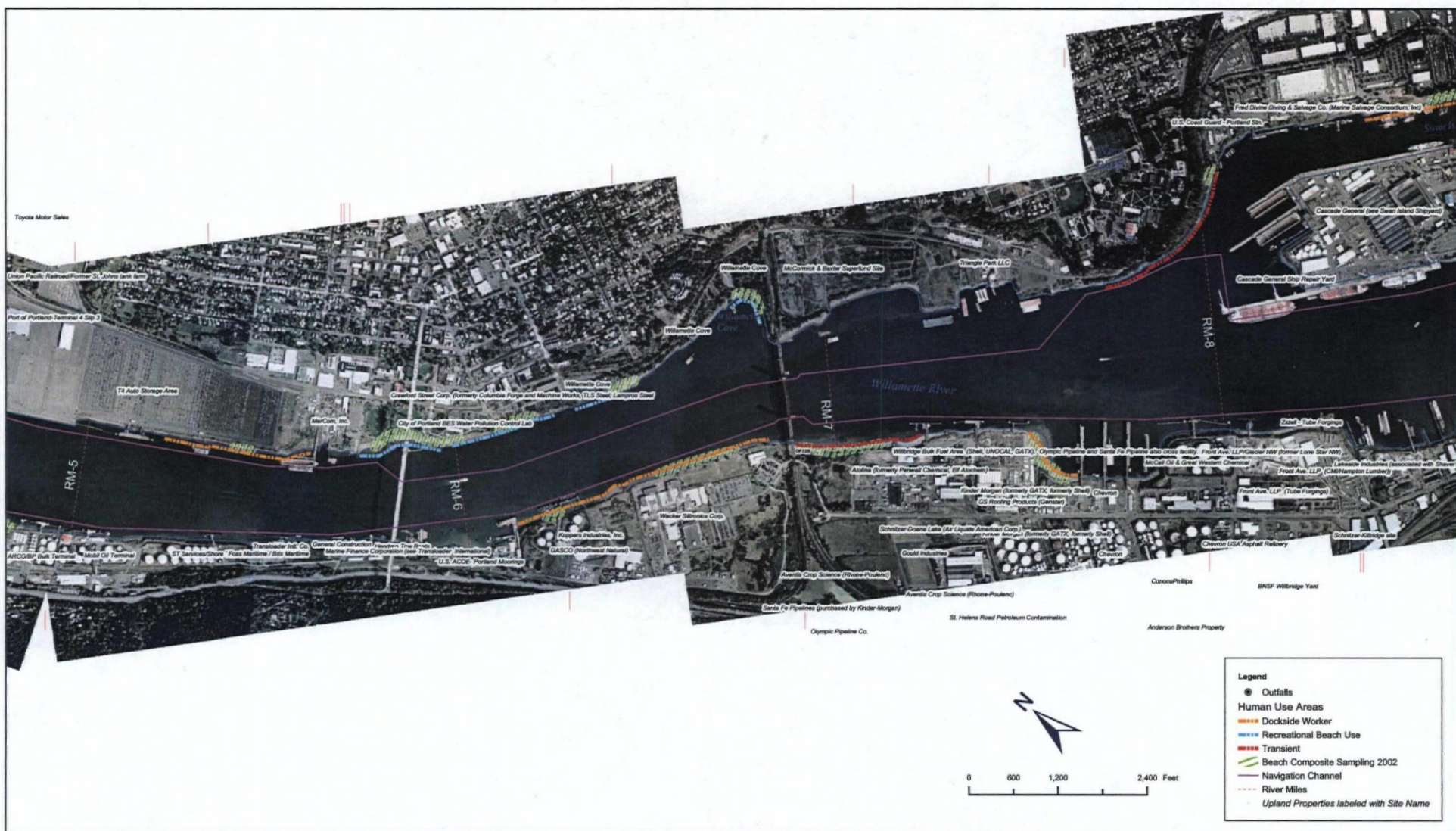
If additional sampling is conducted, a Round 2 field sampling report for collection of shoreline expressions of groundwater discharges to human use beach areas will be prepared and submitted to EPA within 60 days of completing the field sample collection effort described in this FSP. The field sampling report will summarize field sampling activities including sampling locations (maps), requested sample analyses, sample collection methods, and any deviations from the FSP.

LWG-validated data for the samples described in this FSP will be delivered to EPA in an electronic format within 120 days of completing sample collection.

Sample results for shoreline expressions of groundwater discharges to human use beach areas will be reported in tabular form in the Round 2 Comprehensive and the BLRA. The BLRA will be prepared after all sampling and analysis rounds for the project are completed.

5.0 REFERENCES

- AMEC. 2004. Letter to Oregon Department of Environmental Quality. Outfall 22b Camera Survey Results and Field Sampling Plan, RP-Portland Site. August 16, 2004.
- AMEC. 2005. Draft Outfall 22B Storm Sewer Sampling Report, RP-Portland Site. March 24, 2005.
- EPA. 2004. EPA Region 9 Preliminary Remediation Goals (PRGs). U.S. Environmental Protection Agency, Washington, DC. (20 October 2004).
- Groundwater Solutions, Inc. 2003a. Technical Memorandum: Results of Seep Reconnaissance Survey River Mile 2 – 10.5, Lower Willamette River. USEPA Docket No: CERCLA-10-2001-0240.
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- Integral, Kennedy/Jenks, and Windward. 2005. Round 2 Groundwater Pathway Assessment Sampling and Analysis Plan. Prepared for Lower Willamette Group, Portland, OR. Integral Consulting, Inc., Mercer Island, WA; Kennedy/Jenks Consultants, Portland, OR; Windward Environmental LLC, Seattle, WA.
- Integral and Windward. 2004. Round 2 Laboratory Quality Assurance Project Plan, Portland Harbor RI/FS. Prepared for Lower Willamette Group, Portland, OR. Integral Consulting, Inc., Mercer Island, WA.
- Integral, Anchor Environmental, and Windward. 2004. Round 2 Field Sampling Plan, Sediment Sampling and Benthic Toxicity Testing, Portland Harbor RI/FS. Prepared for Lower Willamette Group, Portland, OR. Integral Consulting, Inc., Mercer Island, WA.
- Integral, Windward, Kennedy/Jenks, Anchor, Groundwater Solutions. 2004a. Portland Harbor remedial investigation/feasibility study programmatic work plan. Prepared for Lower Willamette Group. Integral Consulting, Inc., Mercer Island, WA; Windward Environmental LLC, Seattle, WA; Kennedy/Jenks Consultants, Portland, OR; Anchor Environmental, LLC, Seattle, WA; Groundwater Solutions, Inc., Portland, OR.
- Kennedy/Jenks Consultants. 2004. Exposure Point Concentration Calculation Approach and Summary of Exposure Factors Interim Deliverable for the Human Health Risk Assessment. Prepared for Lower Willamette Group, Portland, OR. Kennedy/Jenks Consultants, Portland, OR.
- Striplin Environmental Associates. 2002. Round 1 Health and Safety Plan, Portland Harbor RI/FS. Prepared for Lower Willamette Group, Portland, OR. Striplin Environmental Associates, Olympia, WA.



FEATURE SOURCES:
 Mosaic digital photos: Geo-referenced Digital Ortho-photo Mosaics (Rt on one CD). 4" and 8" mosaics were created during development of the 0.33" resolution.
 Date of Photography: 10-15-2001
 Transportation, Water, Property, Zoning or Boundaries: Metro RLBS
 Channel & River miles: Developed from US Army Corps of Engineers information.
 Human use areas: Collected and collated from: Willamette River Atlas shape file
 December 2001 land by referencing 10/15/01 aerial Ortho-photos and field conditions. (SEA & KJ)
 Beach Composite Sampling 2002: Polygon shape file sketched surrounding the immediate vicinity of composite beach samples taken as part of Round 1 Field Sampling Program.
 File name: WP-2003_4-4_Cultural-and-Human-Res.mxd
 PLOT DATE: 04/12/05

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Figure 2-1
Portland Harbor RI/FS
Appendix C
Human Health Risk Assessment Approach
Human Use Areas





PORTLAND HARBOR RI/FS

ATTACHMENT A

STANDARD OPERATING PROCEDURE FOR

SAMPLING OF SHORELINE SEEPS

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1.0 Sampling Procedures

1.1 SAMPLING OBJECTIVES

The purpose of this Standard Operating Procedure (SOP) is to define and standardize the methods for collecting and processing samples of surface-expressed groundwater (seeps or other discharges of groundwater containing chemical of interest [COIs]) in human use beaches. The sampling objectives are as follows:

- To obtain a free-flowing (not pooled), representative sample of groundwater expressed at the surface in a human use beach¹
- To minimize collection of solids with the water sample, by minimizing suspension of sediments in the sample collection process.

Three sampling techniques are described in this SOP; the final technique applied will be determined in the field based on surface flow rates and other field conditions at the time of sampling.

Seep sample collection, sample handling and field documentation will be conducted by Kennedy/Jenks Consultants. Sample analysis will be performed in accordance with an addendum to the Round 2 Quality Assurance Project Plan (Round 2 QAPP) (Integral and Windward 2004) to be submitted at a later date.

1.2 SUMMARY OF SAMPLING ACTIVITIES

Samples will be collected from the upstream portion of the groundwater surface expression within the human use beach area. If seep water flows are low, sampling will not be performed or may be deferred to a later date, when adequate depth of channelized water exists to allow for sample collection.

Unfiltered samples will be collected at each location. Samples will be directed into appropriate pre-preserved sampling containers and stored on ice until receipt at the laboratory.

Field parameters (temperature, conductivity, and turbidity), location coordinates, and seep water level depth will be recorded for each sample station. Portable field analytical tools will be operated in accordance with manufacturer

¹ The groundwater expression to be sampled originates as shallow groundwater infiltration into a city storm sewer pipe, which subsequently discharges to a beach area via City of Portland Outfall 22B. Sampling will be performed at least 72 hours after a rainfall event to reduce the effects of mixing with storm water runoff.

specifications, and will be calibrated in the field immediately prior to use. Additionally, digital photos will be taken of the area at the time of sampling.

If the applied sampling procedure generates turbidity within the sample, sediments in collected seep waters will be allowed to settle at the laboratory prior to sample processing and storage. Alternatively, a large pore-sized filter may be used at the laboratory to remove disturbed sediments from the sample prior to processing and storage.

1.3 SUMMARY OF METHODS

Three sample collection methods are presented in this SOP: (1) Bottle mouth submersion grab sampling, (2) peristaltic pump sampling, and (3) sampling from a temporary flow control/measurement device (flume or weir). Alternative sampling methods using temporary pits or piezometers may produce samples that are not representative of groundwater expressed at the ground surface; therefore these methods will not be applied. Sampling crews will determine the most appropriate of the three sampling methods in the field, based on surface flow rates of the groundwater expression and the nature of the discharge area (channel bed material, depth of channelized flow, etc.), applying the guidance presented in Section 1.4.1.

1.3.1 Bottle Mouth Submersion Sampling

This sampling technique involves dipping the mouth of the sample container into the flowing surface water. The mouth of the container should not touch the bottom of the channel, and care should be taken to avoid disturbance of sediments upstream of the sampling point. In cases where the sampling point is an actual outfall, it may be possible, and preferable, to hold the bottle immediately below the point of discharge, before the discharge ever contacts the sediment.

1.3.2 Peristaltic Pump Sampling

Sampling with a peristaltic pump is accomplished by lowering the intake tubing line into the channelized flow and pumping the sample into the appropriate sample containers. Care should be taken to avoid disturbance of sediments upstream of the sampling point. Additionally, pumping rates should be low and the intake tubing should be kept above the bottom of the channel, to minimize collection of sediments with the water sample.

1.3.3 Sampling Using a Temporary Flow-Control Device

A temporary flow control device can be used to collect samples under low flow conditions. This technique is more labor-intensive and time-consuming than the submersion and pumping methods. The method involves installation of a temporary, low-flow flume or weir in the path of the channelized discharge. The device must be properly leveled and installed in accordance with equipment specifications. Once installed, the equipment must be left in place for an adequate length of time to allow for suspended sediment to pass through the system or settle in the upstream pool created by the device. Following settling of suspended materials, samples can be collected directly from the downstream end of the device. Additionally, flow rates can be estimated by measurement of water depth at the appropriate location, depending on the device (e.g., in the throat of the flume, in a stilling well (if attached), in the backwater pool, etc.).

1.4 SUPPLIES AND EQUIPMENT

The following major pieces of equipment may be required to collect water samples from surface expressions of groundwater, depending on the sampling method selected: (1) a handheld GPS unit, (2) pH meter, (3) conductivity meter, (4) turbidity meter, (5) appropriate pre-preserved sample containers, (6) adjustable rate peristaltic pump and associated maintenance supplies, tubing, and power source, (7) portable H-flume or V-notch weir, (8) digital camera, and (9) a data logbook. A full listing of the required equipment is provided in Table 1, including health and safety equipment.

1.5 PROCEDURES

This section presents sampling procedures for each sampling method, as well as equipment decontamination procedures.

1.5.1 Shoreline Seep Sampling Procedures

For sample collection, the following decision process will be followed to select the appropriate method:

- If an outfall point (end of a pipe) is selected as the appropriate sampling point, the sample container may be placed below the mouth of the outfall to catch the sample prior to contact with the sediments. General procedures described in Section 1.4.1.1 should be followed.
- If adequate channelized depth of flow exists to allow for submersion of the mouth of the sample container without contacting the sediments,

then the bottle submersion grab sampling procedure should be followed (described below in Section 1.4.1.1).

- If the depth is inadequate for bottle mouth submersion and the channel bottom is armored with rock or solid ground, then the peristaltic pumping procedure will be applied (described below in Section 1.4.1.2).
- Finally, if the sample depth is inadequate for bottle mouth submersion and the channel bottom is soft and subject to sediment resuspension by pumping, then procedures for sampling by temporary installation of a flume or weir will be followed (described below in Section 1.4.1.3).

1.5.1.1 Bottle Mouth Submersion Sampling Procedures

The following steps will be followed for sample collection in instances where seep water depth in the channel will accommodate submersion of the mouth of the sample container without disturbance of channel sediments.

1. Submerge mouth of sample bottle in water, bottle opening pointing upstream and below the water surface. Take care not to contact the streambed with the sample container. Additionally, upstream disturbance of sediments by wading must be avoided.
2. Additional sample volume should be collected following sample collection for field water quality measurements of temperature, pH, conductivity, and turbidity. Field parameters should be measured in accordance with specifications of the manufacturer of the field analytical equipment. All parameters should be calibrated in the field prior to measurements, and all calibration information will be recorded into the logbook.
3. Samples should be handled and data recorded in accordance with procedures in the Round 2 Field Sampling Plan, Sediment Sampling and Benthic Toxicity Testing (Round 2 FSP) (Integral et al. 2004). Sample handling, labeling and custody documentation also will follow procedures in the Round 2 FSP.

1.5.1.2 Peristaltic Pumping

The following steps will be followed for sample collection by peristaltic pump for instances where seep water depth in the channel is too shallow to accommodate submersion of a sample container without disturbance of channel sediments, and the channel bottom is armored with rock or hard ground.

1. Place the peristaltic pump water intake tube in the seep channel below the water surface. Take care not to contact the streambed with the water

intake tubing. Additionally, upstream disturbance of sediments by wading must be avoided.

2. Fill appropriate sample bottles.
3. Additional sample volume should be collected following sample collection for field water quality measurements of temperature, pH, conductivity, and turbidity. Field parameters should be measured in accordance with specifications of the manufacturer of the field analytical equipment. All parameters should be calibrated in the field prior to measurements, and all calibration information will be recorded into the logbook.
4. Sampling information should be recorded in the field in accordance with the procedures in the Round 2 FSP (Integral et al. 2004). Sample handling, labeling and custody documentation also will follow procedures in the Round 2 FSP.

1.5.1.3 Sampling with a Temporary Flow Control Device

The following steps will be followed for sample collection with a temporary flow control/measurement device.

1. In the exposure area of interest, a section of the channel will be scouted for installation of the device. The reach should be straight, generally low angle (not steep), exhibit clear channelization of flow, and have a free flow of water with no backwater occurring. The device should be installed at the downstream end of this section. Installation of the device should conform to manufacturer's specifications (e.g., width of wing walls, depth of upstream pool, leveling requirements, etc.).
2. The device should be left in place, undisturbed, for a period of approximately 24 hours, to allow settling of disturbed sediments upstream, prior to sample collection.
3. Samples will be collected by placing the appropriate sample container at the downstream discharge point of the device. Upstream disturbance of sediments by wading must be avoided.
4. Additional sample volume should be collected following sample collection for field water quality measurements of temperature, pH, conductivity, and turbidity. Field parameters should be measured in accordance with specifications of the manufacturer of the field analytical equipment. All parameters should be calibrated in the field prior to measurements, and all calibration information should be recorded into the logbook.

5. Water level measurements (at the appropriate measurement point for the selected device) should be collected at the time of sampling to develop flow rate estimates.
6. Sampling information should be recorded in the field in accordance with the procedures in the Round FSP (Integral et al. 2004). Sample handling, labeling and custody documentation also will follow procedures in the Round 2 FSP.

1.5.2 Decontamination Procedures

During sampling, all pH, conductivity, and turbidity meters will be thoroughly washed between sample collection stations with Alconox™ or other phosphate-free detergent and rinsed with deionized water before use at a new station. Additionally, if utilized, the flow control/measurement device and installation tools will be decontaminated prior to use at each sampling station. Rinse waters will be diluted with river water and discarded into the river. Tubing decontamination will not be performed. Instead, new tubing will be used at each station.

1.6 FIELD QUALITY CONTROL PROCEDURES

Field quality control (QC) samples will consist of collection of a field replicate at each sampling station. In addition, all samples for VOC analysis will be stored and shipped with a trip blank. Finally, if samples are not collected directly into sample containers, an equipment rinsate blank will be collected following decontamination of the sampling equipment at each of the investigation areas, prior to sampling at that location.

2.0 References

Integral and Windward. 2004. Round 2 Laboratory Quality Assurance Project Plan, Portland Harbor RI/FS. Prepared for Lower Willamette Group, Portland, OR. Integral Consulting, Inc., Mercer Island, WA.

Integral, Anchor Environmental, and Windward. 2004. Round 2 Field Sampling Plan, Sediment Sampling and Benthic Toxicity Testing, Portland Harbor RI/FS. Prepared for Lower Willamette Group, Portland, OR. Integral Consulting, Inc., Mercer Island, WA.

Table 1. Equipment List for Shoreline Seep Water Sampling

<i>Quantity</i>	<i>Description</i>
2	Coolers containing: 20 lbs wet ice Appropriate pre-preserved sample containers Spare pre-preserved sample containers
1	Handheld GPS unit
1	pH meter
1 set	pH meter calibration buffers: 1 each pH 4.0, pH 7.0, and pH 10.0 buffer solutions
1	Conductivity meter
1	Conductivity meter calibration solution
1	Turbidity meter
1	Turbidity meter calibration solution
1	Masterflex™ Peristaltic pump
2	Pump speed controller boxes
2	Pump heads
2	Spare pump head screws
2	Spare pump fuses (3 amp)
2	Electrical power extension cords, 25 foot
12	10-cm (1/4 ID), C-Flex™ tubing (Masterflex), 0.5-meter (3/16 ID), 890 Teflon™ resin FEP tubing, 30-cm (1/4 ID), C-Flex™ tubing (Masterflex) and 30-cm Teflon™ tubing
1 set	Serial adaptor cables
1	H-flume or V-notch weir, portable
1	Tarp
1	Shovel
1	Set of hand digging tools: trowel, hand rake, etc.
as needed	Straps, bungee cords, nylon rope, cable ties, zip ties Nitrile powderless gloves (3 boxes, large; 2 boxes, medium; 1 box, small) Tape: (2) plastic, (6) labeling, (1) duct, (1) electrical, (1) Teflon™
1	Hand tool box: screwdriver, pliers, crescent wrench
2	Plastic chairs
1	Field log book
1	Digital camera
1	Field sampling plan
1	Health and safety plan with forms Pens: (6) ballpoint, (6) Sharpies
1	Box of single edge razor blades
1	Box of trash bags (13 gal)
1	Box of trash bags (30 gal)

LWG

Portland Harbor RI/FS
Round 2 Field Sampling Plan
SOP for Sampling of Shoreline Seeps
April 29, 2005

Table 1. Equipment List for Shoreline Seep Water Sampling

3 each	Ziploc™ bags (box each size; quart, gallon)
	Nylon gloves (4 pair, large; 2 pair, medium)
5	10-L container with ultrapure, laboratory-grade deionized water
3 each	boxes of Kimwipes™ large and small
	Alconox®
1	Scissors
	Sun-protection lotion
	Spare batteries
	Sampling labels
	Bucket opener
	Foul weather gear
	Safety glasses (1 pair for each person)
1 set	Shipping materials including labels, packing tape, and bubble wrap